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AUK Semiconductor

# SQ6601PT

**Off-Line Quasi-Resonance Flyback Switching Regulator**

## Description

The SQ6601PT is a hybrid IC consists from power MOSFET and a controller IC, designed for Indirect feed-back Quasi-Resonant (including low frequency PRC)fly-back converter type SMPS (Switching Mode Power Supply) applications. this IC realizes high efficiency, low noise, downsizing and standardizing of a power supply system reducing external components count and simplifying the circuit designs. the device is provided in a five pin over-molded TO-220 style package, affording dielectric isolation without compromising thermal characteristics.
(Note). PRC is abbreviation of “Pulse Ratio Control” (On-width control with fixed OFF-time).

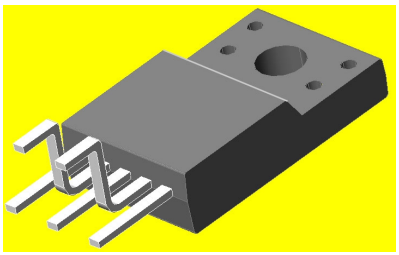
## Features

- Quasi-Resonant Operation
- Low-loss, Pulse-Ration-Control standby mode
- Under-voltage lockout with Hysteresis
- Adjustable switching speed for EMI control
- Low start-up circuit current (100uA max)
- Active low-pass filter for stabilizing the operation in case of light load
- Avalanche Energy Guaranteed MOSFET with high VDSS
- Built-in constant voltage drive circuit
- Built-in step drive circuit
- Built-in low frequency PRC mode (≒20kHz)
- Pulse-by-pulse Overcurrent Protection (OCP)
- Overvoltage Protection with latch mode (OVP)
- Thermal Shutdown with latch mode (TSD)
- Over-molded Five-Pin Package

## Ordering Information

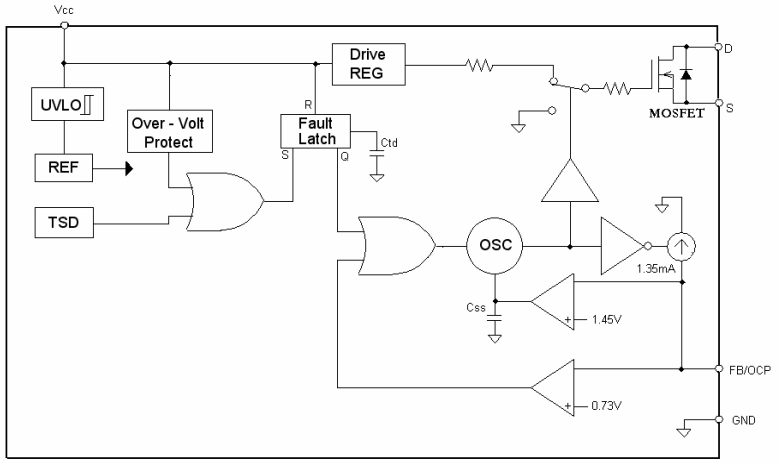
| Type NO. | Marking | Package Code |
|---|---|---|
| SQ6601PT | SQ6601PT | TO-220F-5FL |

## Package Outline



**TO-220 Fullpack (5 Lead)**

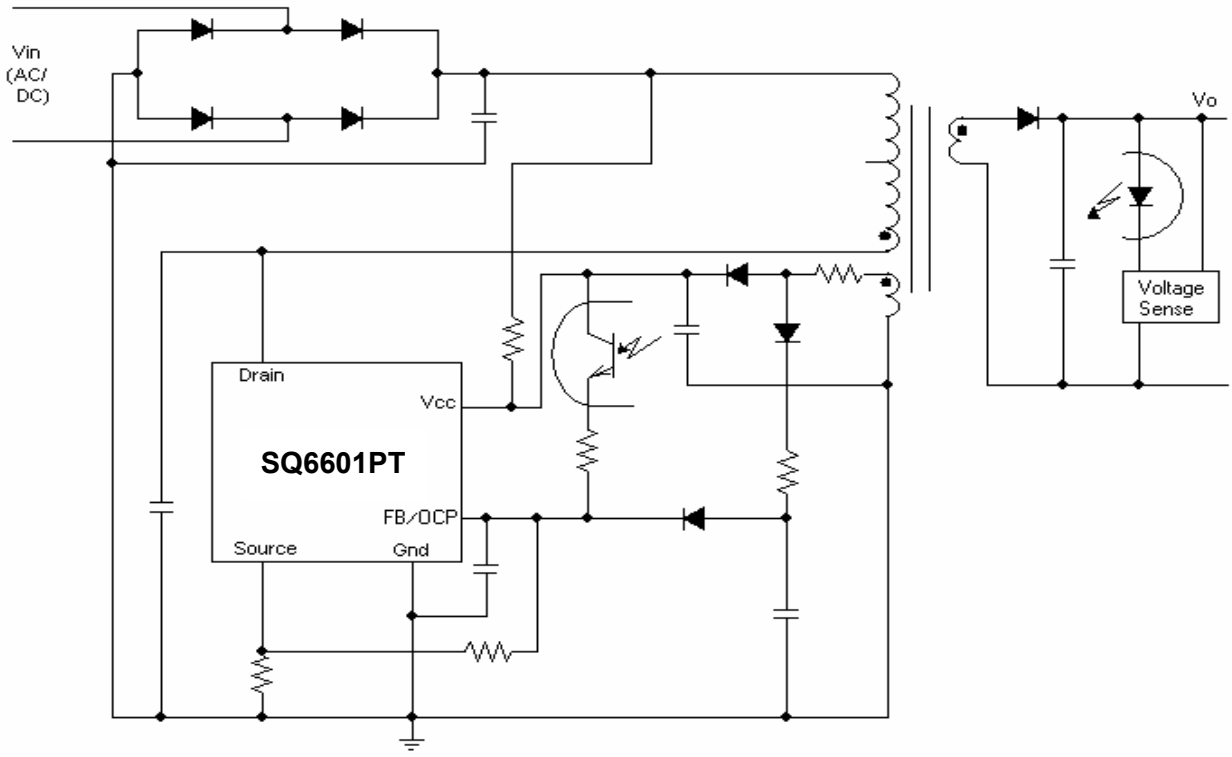
## Internal Block Diagram




## Pin Function

| Pin Number | Pin Name | Pin Function |
|---|---|---|
| 1 | Drain | Power Switch MOSFET Drain Part |
| 2 | Source | Power Switch MOSFET Source Part |
| 3 | GND | Ground of the Control Section |
| 4 | Vcc | Supply Voltage of Output Drive & Control Section |
| 5 | FB/OCP | Voltage Mode Control Feedback Signal & Over Current Detection |

## Typical Connection Diagram



## Absolute maximum ratings

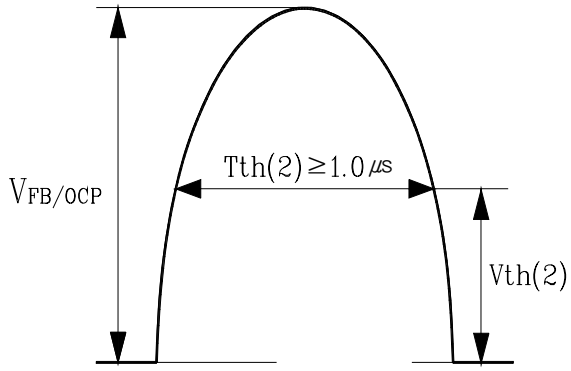
(Ta=25°C, Unless otherwise specified)

| Characteristic | Symbol | Ratings | Unit | Note |
|---|---|---|---|---|
| Drain Source Voltage | $V_{DS}$ | 650 | V | - |
| Drain Current | $I_D$ | 7 | A | $T_C$ = 25℃ |
| Peak Drain Current | $I_{DP}$ | 28 | A | Single Pulse |
| Single Pulsed Avalanche Energy | $E_{AS}$ | 640 | mJ | L=23mH,$V_{DD}$=100V, $I_{DP}$=7.0A |
| Control Supply Voltage | $V_{CC}$ | 20 | V | - |
| FB/OCP Voltage Range | FB/OCP | -0.3 ~ +6 | V | - |
| Power Dissipation | $P_D$ | 40 | W | With infinite heatsink |
| Thermal Resistance, Junction to Case | $R_{thJC}$ | 3.12 | °C /W | - |
| Junction Temperature | $T_J$ | 150 | °C | - |
| Operating Temperature Range | $T_{opr}$ | -25 ~ +125 | °C | - |
| Storage Temperature Range | $T_{stg}$ | -55 ~ +150 | °C | - |

## Recommended Operating Conditions

Time for input of quasi resonant signals.

For the Quasi resonant signal inputted to the $V_{FB/OCP}$ terminal at the time of quasi resonant operation, the signal should be wider than Tth(2)



## Electrical Characteristics

($V_{CC}$ = 11V, Ta = 25°C ; Unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Start Threshold Voltage | $V_{TH(ST)}$ | $V_{CC}$ Increasing | 8.5 | 9.5 | 10.5 | V |
| Stop Threshold Voltage | $V_{TH(SP)}$ | $V_{CC}$ decreasing after turn on start threshold voltage | 7.2 | 8 | 8.8 | V |
| Start up Supply Current | $I_{ST}$ | $V_{CC} = V_{TH(ST)} - 0.1V$ | - | - | 100 | μA |
| Operating Supply Current | $I_{CC}$ | $V_{FB}$ = 1V | - | 3 | 7 | mA |
| Dynamic Operating Supply Current | $I_{DCC}$ | - | - | 4 | 10 | mA |
| Maximum Off Time | $t_{MAX}$ | Drain waveform high | 30 | - | 60 | μs |
| Minimum Off Time | $t_{MIN}$ | Drain waveform high | - | - | 1.5 | μs |
| Minimum Input Pulse Width | $t_{MIN(W)}$ | Drain waveform high | - | - | 1.0 | μs |
| Over Voltage Threshold | $V_{OVP}$ | $V_{CC}$ Increasing until shut down output | 15.3 | 17 | 18.7 | V |
| Latch Release Voltage | $V_{RE}$ | $V_{CC}$ decreasing until latch releasing | 2.5 | - | 6.0 | V |
| Latch Holding Current | $I_{CC(RE)}$ | - | - | - | 400 | μA |
| Feedback Threshold Voltage | $V_{FB}$ | - | 0.68 | 0.73 | 0.78 | V |
| Css Snchronized Voltage | $V_{SYNC}$ | - | 1.3 | 1.45 | 1.6 | V |
| Feedback Sink Current | $I_{SINK}$ | $V_{FB}$ = 1V | 1.2 | 1.35 | 1.5 | mA |
| Thermal Shutdown Activation Temperature | $T_{J(TSD)}$ | - | 140 | - | - | ℃ |
| Drain-to-Source Breakdown Voltage | $V_{DS}$ | $I_D$ = 300uA | 650 | - | - | V |
| Drain Leakage Current | $I_{DS}$ | $V_{DS}$ = 650V | - | - | 300 | μA |
| On-State Resistance | $R_{DS(ON)}$ | $I_D$ = 3.5A | - | - | 1.2 | Ω |
| Rise Time | tr | 10% to 90% | - | - | 250 | ns |

## Electrical Characteristic Curves

**Fig. 1 $I_{CC}$ vs. Ta**

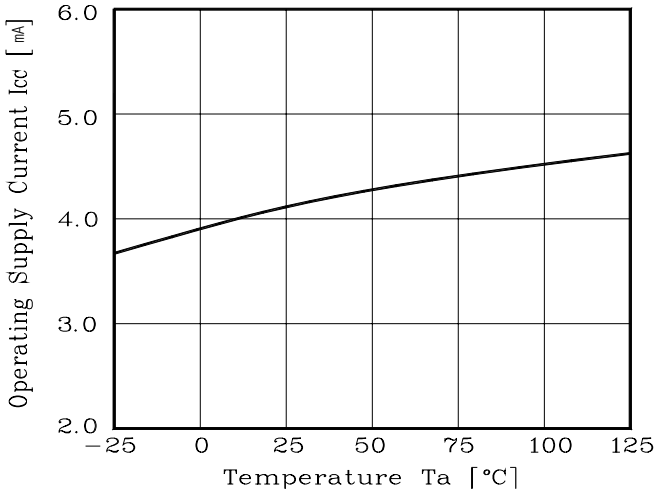



**Fig. 2 $V_{TH(SP)}$ vs. Ta**

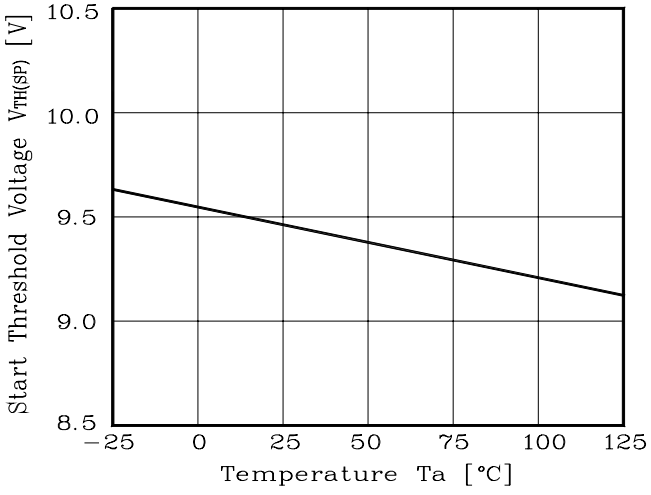



**Fig. 3 $I_{ST}$ vs. Ta**

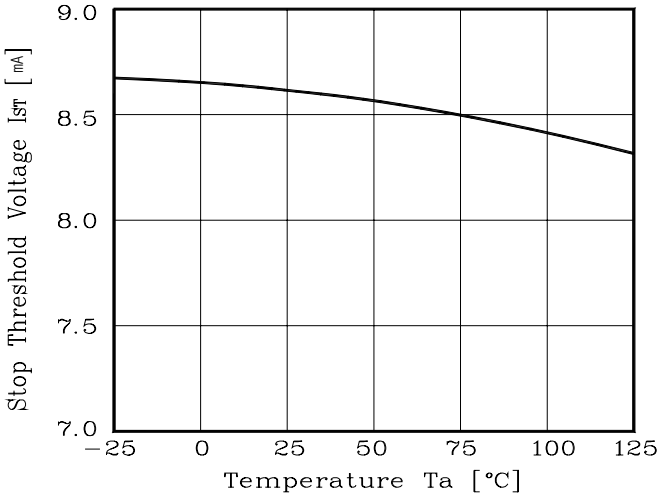



**Fig. 4 $V_{FB}$ vs. Ta**

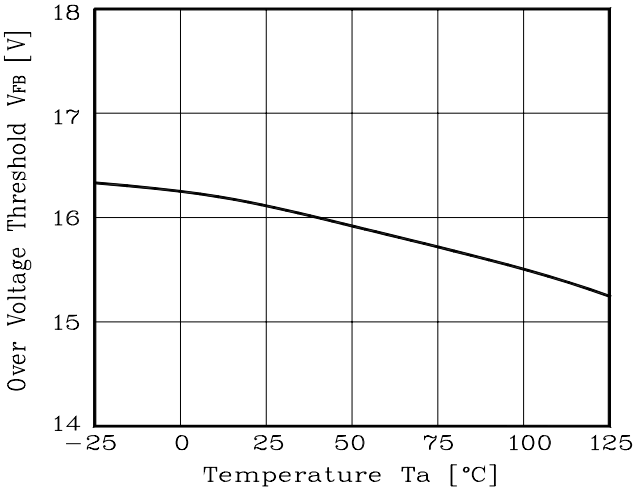



**Fig. 5 $V_{TH(ST)}$ vs. Ta**

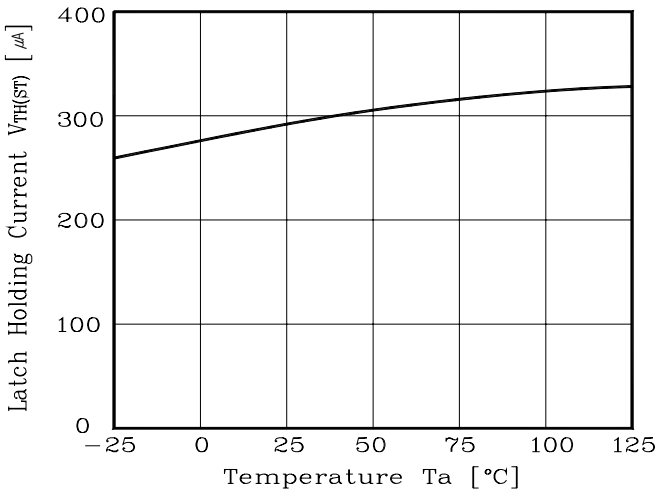
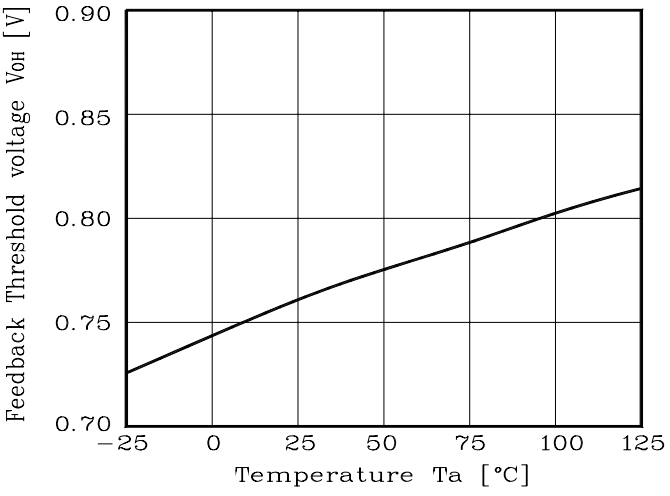



**Fig. 6 $V_{OH}$ vs. Ta**



## Electrical Characteristic Curves

**Fig. 7 $V_{OL}$ vs Ta**

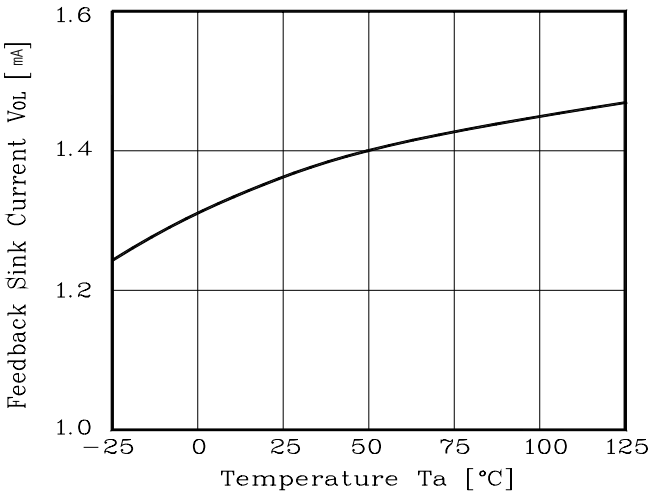



**Fig. 8 $I_{CC}$ vs $V_{th}$**

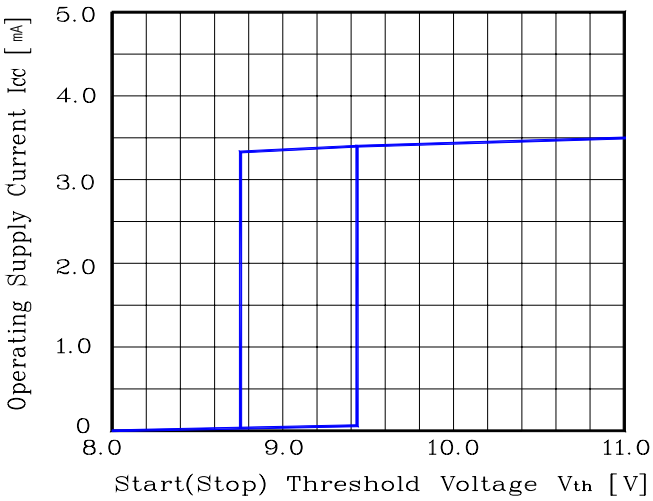



**Fig. 8 Safe Operating Area**

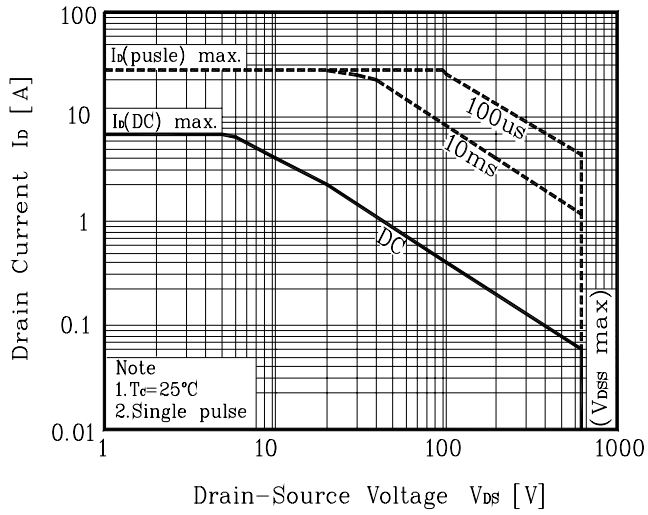



**Fig. 9 $P_D$ vs Tc**

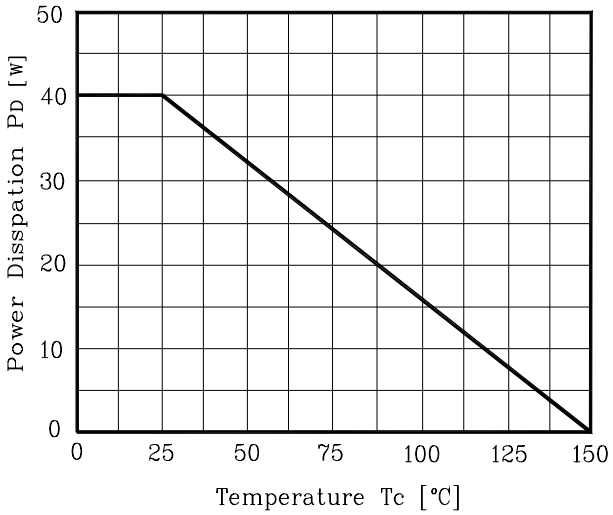
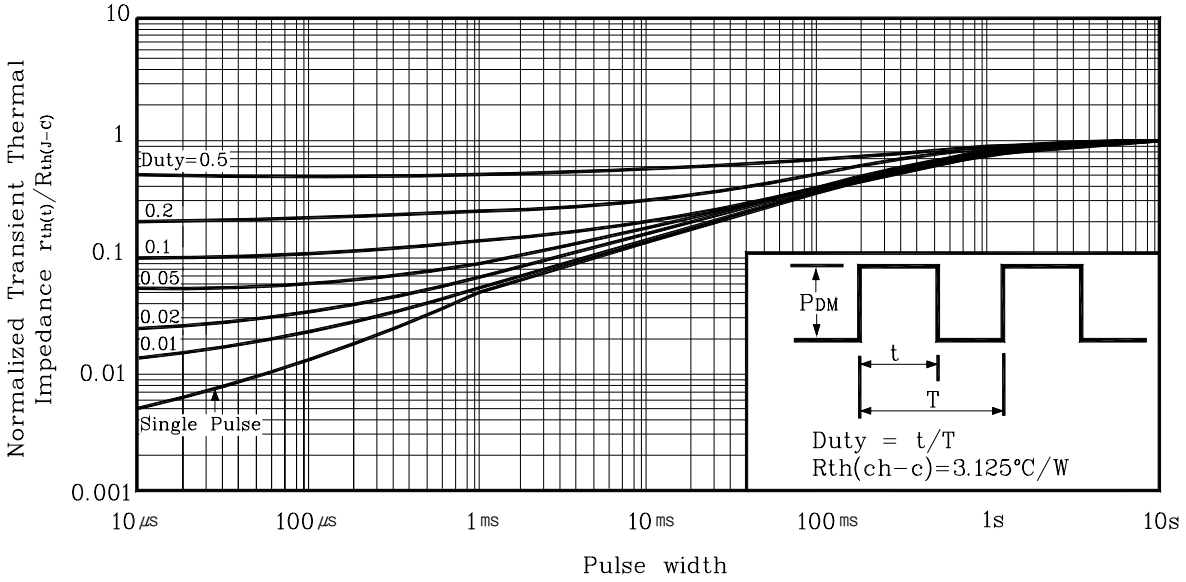
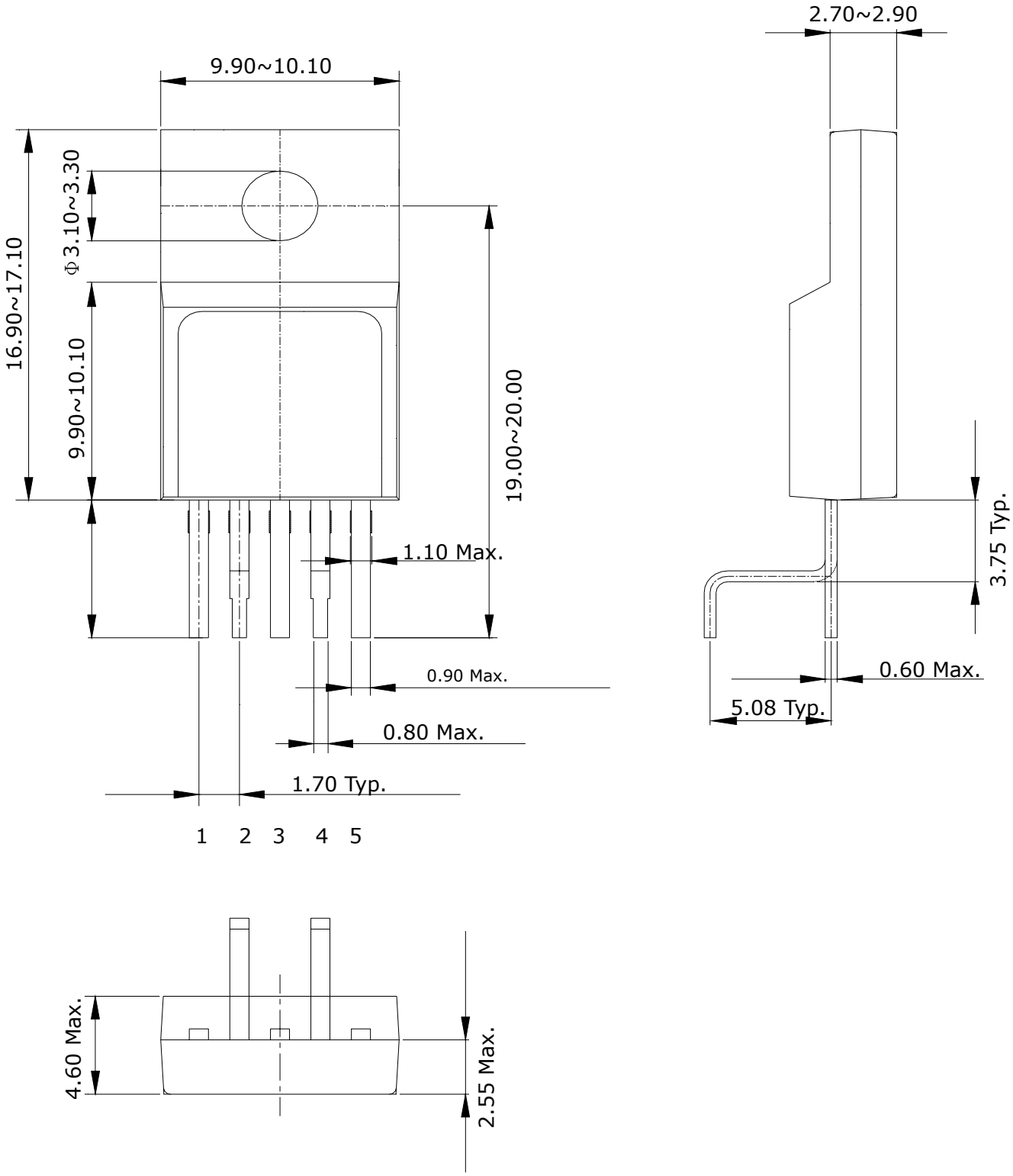



**Fig. 10 Thermal Response**



## Outline Dimensions

unit : mm



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